

REMARKS

The Official Action dated November 4, 2004 has been received and its contents carefully noted. In view thereof, claims 3, 7-13 and 15 have been canceled in their entirety without prejudice nor disclaimer of the subject matter set forth therein and claim 1 as well as the title have been amended in order to better define that which Applicant regards as the invention. Accordingly, claims 1, 2, 4, 14 and 16-31 are presently pending in the instant application with claims 16-31 being withdrawn from further consideration by the Examiner as being directed to a non-elected invention.

With reference now to the Official Action and particularly page 2 thereof, Applicant hereby confirms the election of Species I, claims 1-15 in the Reply filed on September 23, 2004. Accordingly, Applicant notes that claims 16-31 have been withdrawn from further consideration by the Examiner as being drawn to a non-elected species.

With reference to paragraph 3 of the Office Action, the title of the invention has been objected to as not descriptive. As can be seen from the foregoing amendments, the title suggested by the Examiner has been adopted and consequently it is respectfully submitted that Applicant's specification is now in proper formal condition for allowance.

With reference now to paragraph 6 of the Office Action, claims 1, 3, 7, 11, 12 and 13 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,134,452 issued to Yamaguchi in view of U.S. Patent No. 6,093,951 issued to Burr. This rejection is respectfully traversed in that the combination proposed by the Examiner neither discloses nor suggests that which is presently set forth by Applicant's claimed invention.

Specifically, as can be seen from the foregoing amendments, independent claim 1 has been amended to recite a method for fabricating a semiconductor device having an MIS transistor comprising the steps of preparing and epitaxial semiconductor substrate with a multilayer structure, forming a gate electrode above the epitaxial region with a gate insulating

film sandwiched therebetween and forming a diffusion layer on the MIS transistor in the epitaxial region, by using an indium ion, wherein a dose of the indium ion is $5 \times 10^{13}/\text{cm}^2$ or more and the diffusion layer is formed shallower than the epitaxial region. Clearly, the combination proposed by the Examiner fails to disclose such a method.

That is, as the Examiner can readily appreciate in accordance with the present invention, preparing an epitaxial semiconductor substrate with a multilayer structure having an epitaxial region formed by epitaxial growing silicon on a silicon substrate suppresses the occurrence of an EOR (end-or-range) dislocation loop defect derived from a dose of an indium ion at $5 \times 10^{13}/\text{cm}^2$ or more and a leakage current derived from the segregation of the indium ion in the EOR dislocation loop defect layer. Clearly, the combination proposed by the Examiner fails to disclose or suggest the particular method set forth in accordance with Applicant's claimed invention.

As the Examiner can readily appreciate, Yamaguchi discloses a solid phase epitaxial layer 22 as illustrated in Fig. 10B which is formed by implanting silicon ions into the polysilicon layer 22a to be amorphous, then annealing the amorphous polysilicon layer 22a to be single-crystallized. Clearly, this reference fails to disclose forming a diffusion layer by using an indium ion. As a comparison, the epitaxial semiconductor substrate of the present invention forms an epitaxial region on a silicon substrate by using epitaxial growing silicon. In this respect, the present invention clearly differs from the teachings of Yamaguchi.

Further, as to the teachings of Burr, this reference merely discloses forming a pocket diffusion layer by implanting boron at 5×10^{11} to $1 \times 10^{13} \text{ cm}^{-2}$, as well as the fact that indium may be an appropriate pocket dopant for forming the pocket diffusion layer. However, this reference clearly fails to disclose forming a diffusion layer by implanting indium ions at $5 \times 10^{13}/\text{cm}^2$ or more as is specifically recited by Applicant's claimed invention.

In rejecting claim 7, it is noted that the Examiner states that Burr teaches doping with ion at levels at 10^{13} cm^{-2} and over $5 \times 10^{13} \text{ cm}^{-2}$ level with n-type ions such as As and Sb and fails to expressly teach doping with In with a dose of over $5 \times 10^{13} \text{ cm}^{-2}$. The Examiner goes on to state that it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the diffusion layer with In instead of Sb since heavy ions such as In and Sb have smaller diffusion coefficients. However, this is not the case. It should be noted that it is impossible to substitute In (p-type) for Sb (n-type) simply because both Sb and In have smaller diffusion coefficients. It is noted that implantation conditions for Sb cannot be simply applied to those for In whose conductivity type is different from that of Sb. Accordingly, the Examiner's assertion that it would have been obvious to one with ordinary skill in the art at the time of the invention to form the diffusion layer with In instead of Sb is inappropriate in that one of ordinary skill in the art would not be led in the manner suggested by the Examiner because as noted hereinabove it is not possible to merely substitute In (p-type) for Sb (n-type) because implantation conditions for Sb cannot be simply applied to those for In. Accordingly, it is respectfully submitted that independent claim 1 as well as those claims which depend therefrom clearly distinguish over the combination proposed by the Examiner and are in condition for allowance.

With reference now to paragraph 7 of the Office Action, claims 2 and 8 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Yamaguchi in view of Burr as applied to claim 1 above and further in view of U.S. Patent No. 5,177,569 issued to Koyama. This rejection is likewise respectfully traversed in that the patent to Koyama does nothing to overcome the aforementioned shortcomings associated with the combination of Yamaguchi and Burr as proposed by the Examiner.

While Koyama may teach the advantages of open implantations of single crystal plane orientation, it is respectfully submitted that these teachings fail to overcome the

aforementioned shortcomings associated with the combination proposed by the Examiner as discussed in detail hereinabove with respect to independent claim 1. Accordingly, because claims 2 and 8 are directly or indirectly dependent upon independent claim 1, to these claims are believed to further distinguish Applicant's claimed invention over that of the prior art and are in proper condition for allowance.

Referring now to paragraph 8 of the Office Action, claims 4-6, 9, 10, 14 and 15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Yamaguchi in view of Burr as applied to claims 1 and 3 above and further in view of U.S. Patent No. 5,972,783 issued to Arai. Again, this rejection is respectfully traversed in that the patent to Arai does nothing to overcome the aforementioned shortcomings associated with the prior art combination proposed by the Examiner.

In rejecting Applicant's claimed invention, the Examiner states that Arai teaches a method of fabricating a semiconductor device where he forms the pocket diffusion layer on both sides of the gate using it as a mask and the extension diffusion layer using the gate as a mask for the benefit of providing an improved punch through breakdown voltage as noted in column 21, lines 1-3. While this may be the case, the patent to Arai clearly fails to overcome the aforementioned shortcomings associated with the combination of Yamaguchi in view of Burr as discussed in detail hereinabove. Accordingly, in that each of claims 4-6, 9, 10, 14 and 15 are directly or indirectly dependent upon independent claim 1 and include all the limitations thereof, it is respectfully submitted that each of these claims are likewise believed to be in proper condition for allowance.

Referring now to paragraph 9 of the Office Action, claims 1, 3-7 and 9-15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,559,804 issued to Bulucca in view of U.S. Patent No. 6,093,951 issued to Burr and U.S. Patent No. 5,134,452 issued to Yamaguchi. This rejection is also respectfully traversed in that the

combination proposed by the Examiner fails to disclose or remotely suggest that which is presently set forth by Applicant's claimed invention.

The detailed discussion set forth hereinabove with respect to the teachings of Yamaguchi and Burr are hereby incorporated herein by reference with respect to the above rejection of claims 1, 3-7 and 9-15. Furthermore, it is noted that in rejecting Applicant's claimed invention the Examiner states that Bulucca teaches forming pocket diffusion layers by using indium. However, the total dosage into the diffusion layer of Bulucca is 8×10^{12} to 1.5×10^{13} ions/cm² which is significantly different from the total dosage into the diffusion layer as set forth in accordance with Applicant's claimed invention.

With respect to the teachings of Burr, the Examiner asserts in the Office Action that Burr teaches doping with n-type ions such as As and Sb at doses over than 5×10^{13} /cm² and further asserts that it would have been obvious at the time of the invention to form the diffusion layer with In instead of Sb since heavy ions in that In and Sb have smaller diffusion coefficients. However, as noted hereinabove, it is not possible to merely substitute In (p-type) for Sb (n-type), simply because both Sb and In have smaller diffusion coefficients. That is, implantation conditions for Sb cannot be simply applied to those form In, whose conductivity type is different from that of Sb as discussed in detail hereinabove. Accordingly, for the reasons discussed hereinabove it is respectfully submitted that Applicant's claimed invention as set forth in claims 1, 3-7 and 9-15 clearly distinguishes over the combination proposed by the Examiner.

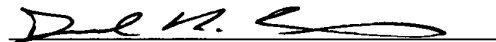
Further, in paragraph 10 of the Office Action claims 2 and 8 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Bulucca in view of Burr and Yamaguchi as applied to claim 1 and further in view of Koyama. Again, as noted hereinabove each of claims 2 and 8 are directly or indirectly dependent upon independent claim 1 and include all the limitations thereof. Accordingly, in that the patent to Koyama does nothing to overcome

the aforementioned shortcomings associated with the combination proposed by the Examiner, it is respectfully submitted that each of these claims likewise distinguish over the combination proposed by the Examiner and are in proper condition for allowance.

Therefore, in view of the foregoing it is respectfully requested that the objections and rejections of record be reconsidered and withdrawn by the Examiner, that claims 1-15 be allowed and the application be passed to issue.

Should the Examiner believe a conference would be of benefit in expediting the prosecution of the instant application, he is hereby invited to telephone counsel to arrange such a conference.

Respectfully submitted,



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